

Young pine trees face new peril from mountain pine beetle

June 23 2015, by Helen Metella



New research shows the survival rate of pine seedlings in western Alberta is dramatically lower in beetle-killed stands—one per cent versus 25 per cent in non-attacked stands—putting the future pine forest at risk.

New research from the University of Alberta's Faculty of Agricultural, Life and Environmental Sciences shows that pine beetle attacks not only lead to the death of adult trees, but can also leave the next generation of pine vulnerable to future insect attack.

"The next [pine](#) forest is at risk," said Justine Karst, an assistant professor in restoration ecology in the Department of Renewable Resources. She's the co-lead author of a new study with Nadir Erbilgin, Canada Research Chair and associate professor in forest entomology and chemical ecology.

Karst said the beetles, which have damaged or killed more than 47 million hectares of mainly lodgepole pine forests in western North America in the past decade, start an unexpected chain of events that increase the vulnerability of future forests to damage.

"There was no reason to think that death of mature trees would affect the resistance of young trees to insect attack, too," said Karst.

That's because pine beetles only attack mature trees, the only ones with enough of the tissue and sugars needed for the survival of hatched juvenile beetles.

In live trees, however, those same sugars also move from the tree into beneficial fungi living on its roots. The fungi increase tree survival and provide nutrients necessary for trees to make defence chemicals to protect themselves against insect attacks. But when trees die, sugars

cease to flow and often many of these fungi disappear, too.

The forest gets "a different suite of fungi," said Karst, and for reasons not entirely understood, this adversely affects the defences of the new pine seedlings.

Pine seedlings establish in fewer numbers, grow more slowly and contain fewer defence chemicals.

Seedling survival in the forests studied in western Alberta was dramatically reduced. In beetle-killed stands the survival rate was one per cent, compared with 25 per cent for those in healthy stands.

These new results shed light on just how far-reaching the legacy of the [mountain pine beetle](#) can be in [pine forests](#) and highlights how fungi can link the fate of adult [trees](#) with that of young pines.

It also invites many new questions. Should pine be replanted, or should the problem be addressed by planting a different tree species? Is this a general phenomenon or something seen only in Alberta? And most important, what's going on in the soil to create such an underlying change in the fungal community?

"It has unanticipated effects on the seedlings; it's harmful to these next generations," said Karst. "So, is it going to have other unintended consequences?"

Karst and her fellow researchers in the faculties of science and ALES at the U of A, and in the Faculty of Forestry from the University of British Columbia, intend to continue focusing on what's happening to the ecosystem below ground, pending funding for upcoming studies.

The study was published in *New Phytologist*.

More information: "Ectomycorrhizal fungi mediate indirect effects of a bark beetle outbreak on secondary chemistry and establishment of pine seedlings." *New Phytologist*. doi: 10.1111/nph.13492

Provided by University of Alberta

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