



*Mountain pine beetles, shown in a photo from an electron microscope, have infested forest land in central British Columbia and are spreading eastward. (Vancouver Sun/Canadian Press)*

**IN DEPTH**  
**Science**

## **The beetle and the damage done**

**Mountain pine beetles are expected to wipe out 80 per cent of B.C.'s pine forest by 2013 — now the race is to stop their eastward expansion**

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By Paul Jay | [CBC News](#)

Before 1993, the mountain pine beetle was just another insect lost amid British Columbia's rich forests. But for the past decade, the burrowing beetle's population has exploded, its infestation of forests in BC's Central Interior continuing unabated as it wipes out growths of the mature lodgepole pine trees so important to the province's lumber industry.

In 2006 alone, 9.2 million hectares of forest were in an advanced stage of attack from the mountain pine beetle. The damage done to the trees has the forestry industry in race to get as much from the pine as they can before the trees die in the aftermath of the beetle attacks.

The provincial government estimates the beetle's spread will have economic implications for 30 communities, including Quesnel, and will

impact 25,000 families whose livelihood depends on the pulp and paper industry.

## **How does the beetle damage the pine?**

The mountain pine beetle is only the size of a grain of rice, but in large numbers it can take down the lodgepole pine from the inside.

It accomplishes this by attacking the trees in large groups. A female beetle starts the process by licking trees until it finds a lodgepole pine mature enough — at least 80 years old.

Once it has located the tree, the female begins boring through the bark, while at the same time secreting a pheromone that attracts male beetles to the site. When the males join in the attack, they too release a pheromone to attract more females who in turn attract more males until a large enough population descends on the tree.

The tree, however, is far from helpless. In response, it secretes a highly toxic resin similar to pitch to kill the beetles. Should the number of beetles attacking the tree be too few, the tree can usually withstand an attack.

But swarming isn't the only tactic the beetle has: a symbiotic relationship with a blue-stained fungus also gives it another advantage over the trees.

The beetles carry spores of this fungus in compartments in their mouths, and as they tunnel their way underneath the bark of the tree they release these spores into the tree. As the fungus spreads through the tree, it stops the spread of the toxic resin and lets the beetles continue tunnelling.

The fungus and the beetles work their way through the tree, with the beetles laying their eggs in hollows created underneath the bark. The larvae born from these eggs feed on the fungus as part of their development into adults and in the process carry away spores from the fungus inside their mouths.

When the beetles emerge from the now-dead tree in search of a new host, they'll be armed with their symbiotic partner.

"They are more of a complex than two separate organisms," said Allan Carroll, a research scientist with the Canadian Forest Service.

"The beetle needs the fungus to feed and to stop the resin and the fungus couldn't get anywhere without the beetles."

## **Why has the beetle spread?**

The spread of the beetle can be traced to two separate issues: forest management and climate change.

Forest management practices designed to limit forest fires have inadvertently supplied the beetles with an overabundance of mature lodgepole pine to feast on.

As part of an evolutionary tactic to spread at the expense of other trees, lodgepole pine cones don't release their seeds until heated by fire. When other trees begin crowding a pine stand, the dense forest becomes more susceptible to forest fires.

When fires do happen they clear out the old forest but leave behind the released pinecone seeds, allowing a new stand of lodgepole to grow where the old one existed, unimpeded by other trees.

But forest management practices geared towards preventing forest fires has allowed the trees to mature beyond their expected age, making the forests older and thus more desirable to the beetles. Carroll estimates less than one per cent of the pine that would have historically burned from forest fires burns today.

While the abundance of food is behind the population explosion, a lack of cold winters to wipe out the beetles and curb the infestations is also to blame.

Warming of the region brought on by climate change has also helped the beetles survive in climates it would normally find inhospitable, such as in forests east of the Rockies like the Peace River valley.

## **How has it affected the pulp and paper industry?**

The dead trees left behind after the beetle attacks can still be logged, but they must be harvested within five to 18 years after they die or they lose their commercial value.

As a result, the forestry industry in the province has increased its annual allowable cuts as an emergency measure to ensure the maximum amount of trees can be salvaged or recovered from beetle-infested timber.

But increased harvests will inevitably be followed by massive reductions once the timber supplies decline and the epidemic is complete.

And though much of the heartwood in the timber is as structurally sound as undamaged pine, there have been complaints that some of the logs now being processed have more breakage than normal.

The wood also carries with it the characteristic blue stain left behind from the fungus.

The overgrowth of mature pine and the increased number of dry, dead trees also increases the risk of a massive forest fire. So the race is on to clear out as many of the dead trees as possible.

## **What's being done to stop the beetles?**

Little can be done in the forests of western British Columbia, where the beetle is too widespread and much of the damage has already occurred, said Carroll. Once the lodgepole pine population dwindles, however, the beetle population should also decline.

The beetle is expected to have wiped out 80 per cent of the pine forest by 2013.

The more pressing concern is the areas the beetle has spread to but not completely overrun like the northeastern slopes of the Rocky Mountains and the Peace River valley of northern British Columbia and Alberta.

These are the front lines in a battle to prevent the eastward expansion of the beetles into the boreal forest, where billions of trees might be affected.

In those locations foresters are trying to identify mature pine stands that have become infested but have not yet released their beetle brood.

The leaves of trees that have died turn a bright red, providing clues to where the insects have been. Ground crews then fell the beetle-infested trees and burn them in winter to prevent their spread to other locations.

Other techniques to curb the beetle population include both controlled forest fires and pheromone baiting, a tactic where the beetles are lured to trees with a synthetic hormone that mimics the scent of the female beetle and then destroyed.

While none of these methods will kill the beetle population, they could slow them down and allow their population levels to return to normal.

But even these measures come with ecological risks of their own. The Peace River valley, for example, is home to woodland caribou not amenable to changes to their environment.

"Here you have a situation where the objective and methods of stopping the spread of the beetles is diametrically opposed to the needs of another species," said Carroll.

"It becomes an important question: how do we achieve one goal without affecting another?"

## **What happens if the beetle continues to spread?**

The worry of the pulp and paper industry and conservationists alike is that the beetle will spread east on a diet of the jack pine, a close relative of the lodgepole pine.

The beetle has shown a taste for the jack pine found in the boreal forest, the massive northern ecoregion that stretches from Alaska to Newfoundland.

Whether its spread will be as rapid is uncertain, as the boreal forest hasn't been subjected to the same management practices as the British Columbia's interior forests. As a result, it may not have enough mature pine to sustain an outbreak of the beetle population.

But that's only a theory, and forestry officials like Carroll are trying to determine the exact makeup and composition of the boreal forest to see whether it would provide enough food to pose a danger of another outbreak.

But there is equal danger in the unknown, as Carroll worries the introduction of a species of insect not native to the forest could pose unforeseen threats to the northern ecosystem.

"This system hasn't evolved a way to deal with the beetle. How will it react to an invasion? Right now, we don't know," he said.