

# Beetles, wildfire: Double threat in warming world

August 23 2009, By CHARLES J. HANLEY , AP Special Correspondent

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In this Aug. 6, 2009 photo, Rob Legare, forest health expert with the Yukon Forest Management Branch, explains how the spruce bark beetle has attacked 400,000 hectares (1 million acres) of forest in the Canadian territory, cutting off spruce trees' food supply, turning their needles red and eventually killing them, in the thick woods of the Alsek River valley, near Haines Junction, Yukon Territory. Scientists warn that global warming will spur insect infestations and wildfires in the world's northern forests. (AP Photo/Rick Bowmer)

(AP) -- A veil of smoke settled over the forest in the shadow of the St. Elias Mountains, in a wilderness whose spruce trees stood tall and gray, a deathly gray even in the greenest heart of a Yukon summer.

"As far as the eye can see, it's all infested," forester Rob Legare said, looking out over the thick woods of the Alsek River valley.

Beetles and fire, twin plagues, are consuming northern forests in what scientists say is a preview of the future, in a century growing warmer, as the land grows drier, trees grow weaker and pests, abetted by milder winters, grow stronger.

Dying, burning forests would then only add to the warming.

It's here in the sub-Arctic and Arctic - in Alaska, across Siberia, in northernmost Europe, and in the Yukon and elsewhere in northern [Canada](#) - that Earth's climate is changing most rapidly. While average temperatures globally rose 0.74 degrees Celsius (1.3 degrees Fahrenheit) in the past century, the far north experienced warming at twice that rate or greater.

In Russia's frigid east, some average temperatures have risen more than 2 degrees Celsius (3.6 degrees Fahrenheit), with midwinter mercury spiking even higher. And "eight of the last 10 summers have been extreme wildfire seasons in Siberia," American researcher Amber J. Soja pointed out by telephone from central Siberia.

Along with shrinking the polar ice cap and thawing permafrost, scientists say, the warming of the Arctic threatens to turn boreal [forest](#) - the vast cover of spruce, pine and other conifers blanketing these high latitudes - into less of a crucial "sink" absorbing carbon dioxide and more of a source, as megatons of that [greenhouse gas](#) rise from dead, burning and decaying wood.

American forest ecologist Scott Green worries about a "domino effect."

"These things may occur simultaneously," said the researcher from the University of Northern British Columbia. "If the bark beetles kill the trees, you'll have lots of dead, dry wood that will create a really, really hot fire, and then sometimes you don't get trees regenerating on the site."

Dominoes may already be falling in western North America.

From Colorado to Washington state, an unprecedented, years-long epidemic of mountain pine beetle has killed 2.6 million hectares (6.5 million acres) of forest. The insect has struck even more devastatingly to the north, in British Columbia, where clouds of beetles have laid waste to 14 million hectares (35 million acres) - twice the area of Ireland. It is expected to kill 80 percent of the Canadian province's lodgepole pines before it's finished.

Farther north, in the Yukon, the pine beetle isn't endemic - yet. Here it's the spruce bark beetle that has eaten its way through 400,000 hectares (1 million acres) of woodland, and even more in neighboring Alaska, in a 15-year-old epidemic unmatched in its longevity and extent.

"It's a fingerprint of climate change," Aynslie Ogden, senior researcher for the Yukon Forest Management Branch, said in Whitehorse, the territorial capital. "The intensity and severity and magnitude of the infestation is outside the normal."

Hiking through the wild and beetle-ravaged Alsek valley, Legare, the Yukon agency's forest health expert, explained how the 6-millimeter (quarter-inch) insect does its damage.

"Usually the female bores into the tree first, followed by the male, and then they mate and they both excavate a main egg gallery which runs parallel to the wood grain," he said.

The hatched larvae, just beneath the outer bark, then feed via perpendicular galleries they bore around the tree, cutting off nutrients moving through the phloem and killing the plant. Its needles turn reddish, later gray, and eventually wind topples the dead wood.

Winter spells of minus-40-Celsius (minus-40-Fahrenheit) temperatures once killed off larvae, but those deep freezes now occur less often. And warmer summers enable some beetles to complete their reproductive cycle in one year instead of two, speeding up population growth.

Years of summer drought, meanwhile, weakened the spruces' ability to extrude sticky pitch, to trap and expel beetles. Because the snow-streaked peaks of the 5,000-meter-high (15,000-foot-high) St. Elias range block moisture from the Pacific, a mere 250 millimeters (10 inches) of precipitation falls each year. Even a slight shortfall stresses the trees.

The Yukon has experienced smaller, briefer beetle outbreaks in the past, fed by patches of fallen trees left by road construction. But "what makes this infestation different" is that climate change is a primary cause, said Legare.

As he spoke, smoke from dozens of fires, some nearby in the Yukon, some in distant Alaska, wafted over a landscape already bleak with dead forest.

In an authoritative 2007 assessment, the Intergovernmental Panel on Climate Change (IPCC), the U.N.-sponsored scientific network, cited multiple studies linking the spread of wildfires to warmer, drier conditions.

This June, in the latest such study, as early flames flared in California's wildfire season, Harvard scientists said the area burned in the western United States could increase by 50 percent by the 2050s, even under the best-case warming scenario projected by the IPCC.

In Siberia, "fire has been increasing, and there's an earlier fire season," Soja, of the U.S. National Institute of Aerospace, reported from the

Sukachev Institute of Forestry in Krasnoyarsk. Her research this summer found that a warmer, drier climate appears to be stifling regrowth of burned-out areas on the Siberian forest's southern edge, turning them to grasslands.

In Canada, area burned is double what it was in the 1970s, despite greater firefighting capacity and some recent favorable weather, said Mike Flannigan, a fire researcher for the Canadian Forest Service.

He cited three key reasons: warmer temperatures are drying the forests, lengthening the fire season and generating more lightning, cause of the worst wilderness fires.

Flannigan worries, too, that future fires smoldering through the carbon-heavy peatlands that undergird much of the boreal region would pour unparalleled amounts of carbon dioxide, the main global-warming gas, into the skies, feeding an unstoppable cycle.

"The bottom line is if you get more fire, you get more emissions, which contributes to further warming, which contributes to more fires," he said in an interview from Ontario.

"The concern is that things may happen more rapidly than we anticipate. Even our most pessimistic scenarios may not be pessimistic enough."

Back here in smoky gray southwest Yukon, where things are happening, the 1,400 native Champagne-Aishihik people feel it most. The stricken forest's fallen trees are keeping them from traditional fur-trapping rounds, the streams seem warmer without thick cover overhead, and the fishing is off.

Their oral tradition tells of great change in the past, said the group's land manager, Graham Boyd. "They're now wondering what changed to have

had this happen."

What's changed extends beyond Champagne-Aishihik lands to the rest of the Yukon, where forester Legare in his travels finds other insects - the northern spruce engraver, the aspen leaf miner, the willow miner - gaining an upper hand in unusual places in unexpected ways.

"Weird things, unprecedented things are happening," he said.

Over the top of the world in Siberia, they're girding for a surge in the highly destructive Siberian moth, a caterpillar that devours forests of pine, spruce, fir and larch.

"The moth loves warm and dry, and that's what's happening," said Nadezda M. Tchebakova, Soja's Siberian research partner. At the same time, she said from Krasnoyarsk, "the frequency and severity of fires should increase."

As the Yukon warms and burns, its foresters hope for at least an early warning on one immediate threat, the mountain pine beetle. They have set traps at the British Columbia border to alert them if the non-native insect moves northward.

"The Yukon pines probably don't have natural defenses. They may be uniquely susceptible to this pest," said ecologist Green. "Then you'll have the potential for fires in large areas of dead trees. With the needles still on them, they literally explode with fire."

Of her Yukon woodlands, Ogden said, "It's the right forest, the right climate type, and we expect the climate to warm. My sense is it" - the pine beetle - "is almost inevitable."

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Citation: Beetles, wildfire: Double threat in warming world (2009, August 23) retrieved 3 May 2024 from <https://phys.org/news/2009-08-beetles-wildfire-threat-world.html>

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