

Forest growth accelerating due to carbon dioxide ‘fertilization effect’

Rising levels of carbon dioxide in the atmosphere are accelerating the growth of B.C.’s forests by one to three per cent a year, enough to cancel out the impact on the climate from the mountain pine beetle outbreak by 2020, according to a new study from the Pacific Institute for Climate Solutions.

“This turnaround will happen much sooner than we had imagined,” said lead author and Environment Canada climate scientist Vivek Arora.

The pine beetle infestation, which killed countless trees over 18 million hectares, had a double impact — dramatically reducing the ability of western Canadian forests to store carbon, and worse, releasing massive quantities of carbon as dead stands of pine rotted or burned. The combined effect turned B.C. forests from a carbon sink (a reservoir) into a carbon source during the peak years of the outbreak between 2009 to 2011, said co-author Werner Kurz of the Canadian Forest Service.

Computer models estimate that B.C. forests stored 328 million tonnes less carbon dioxide and released in excess of one billion tonnes of CO₂ into the atmosphere during the outbreak, which began in 1999. However, the effects of global warming — rising temperatures, higher rainfall, and an atmosphere richer in carbon dioxide — have created a “fertilization effect” that has accelerated the growth of trees, especially in the high-latitude forests that cover much of Canada, Russia and Europe.

Relatively cool temperatures in Canadian forests typically limit tree growth and carbon uptake to less than half the rate seen in tropical latitudes. But that is beginning to change.

New research suggests that climate change has increased the rate of growth and carbon storage in our forests, so much so that an additional one billion tonnes of carbon dioxide will be stored by our trees between the pine beetle outbreak and 2020.

“We have transitioned from a period at the peak of the mountain pine beetle outbreak, when the forests were a carbon source, to now, where they have become a sink (again),” said Kurz.

About half of all greenhouse gas emissions are absorbed by plants on land and in the ocean, but that hasn’t been enough to keep pace with the amount of CO₂ being released by human sources.

“Climate changes naturally over the long term, but over the past 150 years we have seen a rise in the concentration of carbon dioxide and other greenhouse gases in the atmosphere that has been much more rapid than at any time in the past 600,000 years,” said Arora.

Cooler temperatures limit the ability of high-latitude forests to grow, which has placed a natural cap on the amount of CO₂ they can absorb and store. Until recently.

“In B.C., the scientific evidence is that our forests are growing faster than in the past due to a warming climate,” said Arora. “This is helping us recover from the carbon impact of the mountain pine beetle outbreak sooner than we imagined.”

Arora’s computer model reflects real-world growth rate data collected by the Canadian Forestry Service between 1958 and 1990, then extrapolates the trend line.

“When we run the model forward, it suggests that if the trees keep growing at this rate then we will more than compensate for the losses associated with the pine beetle,” he said.