

Charcoal remains could accelerate CO₂ emissions after forest fires

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A field in the Russian Far East after a forest fire. Due to the location of the trees, the concentration of charcoal differs from place to place. Credit: Bryantin S.V.

Charcoal remains after a forest fire help decompose fine roots in the soil, potentially accelerating CO₂ emissions in boreal forests.

Boreal forests are a huge carbon sink. The fine roots, not only the leaves, stems and branches of trees, largely contribute to carbon accumulation. The Russian Far East has had an increasing number of forest fires, many of which are believed to be caused by global warming and human activities. Burning trees in forest fires naturally cause the emission of CO₂, but little is known about the extent to which fire-derived charcoal influences ecosystem processes, such as soil [organic matter decomposition](#).

The researchers, including Russian Academy of Science Senior Researcher Semyon Bryanin and Hokkaido University Assistant Professor Makoto Kobayashi, performed field litterbag experiments over 515 days, incubating fine larch roots with varying concentrations of charcoal in the soil. Mass loss of fine roots was measured in each of four conditions over nearly two years: control (no charcoal); mean charcoal content measured in the field; twice the mean charcoal content measured in the field; and charcoal content equal to the maximum concentration in the field.

According to the results, charcoal had little effect on the decomposition of fine roots right after they were buried in soil. But at the end of the experiment, the loss of [root](#) mass in samples incubated with higher concentrations of charcoal was greater (double content: 40 percent; maximum content: 42 percent) than in the control (30 percent) and the average content conditions (27 percent). "Our study has provided the first field evidence that fire-derived [charcoal](#) might accelerate the decomposition of fine larch roots and consequently CO₂ emissions from boreal [forest](#)," says Makoto Kobayashi.

The finding likely will help predict future changes in CO₂ concentration in the atmosphere should more [forest fires](#) be triggered by [global warming](#) and human activities.

More information: Semyon Bryanin et al. Fire-derived charcoal might promote fine root decomposition in boreal forests, *Soil Biology and Biochemistry* (2017). [DOI: 10.1016/j.soilbio.2017.09.031](https://doi.org/10.1016/j.soilbio.2017.09.031)

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