

Surface-Level Ozone Pollution Set To Reduce Tree Growth 10% By 2100

ScienceDaily (Dec. 10, 2008) — Modern day concentrations of ground level ozone pollution are decreasing the growth of trees in the northern and temperate mid-latitudes, as shown in a paper publishing December 9 in *Global Change Biology*. Tree growth, measured in biomass, is already 7% less than the late 1800s, and this is set to increase to a 17% reduction by the end of the century.

Ozone pollution is four times greater now than prior to the Industrial Revolution in the mid-1700s; if modern dependence on fossil fuels continues at the current pace, future ozone concentrations will be at least double current levels by the end of this century with the capacity to further decrease the growth of trees.

The study is the first statistical summary of individual experimental measurements of how ozone will damage the productivity of trees, including data from 263 peer-reviewed scientific publications.

Ozone is the third strongest greenhouse gas, directly contributing to global warming, and is the air pollutant considered to be the most damaging to plants. But more importantly, it has the potential to leave more carbon dioxide, ranked as the first strongest greenhouse gas, in the atmosphere by decreasing carbon assimilation in trees. Ozone pollution occurs when nitrogen oxides have a photochemical reaction with volatile organic compounds.

“This research quantifies the mean response of trees to ozone pollution measured in terms of total tree biomass, and all component parts such as leaf, root and shoot, lost due to ozone pollution,” said Dr. Victoria Wittig, lead author of the study. “Looking at how ozone pollution affects trees is important because of the indirect impact on carbon dioxide concentrations in the atmosphere which will further enhance global warming, in addition to ozone’s already potent direct impact.”

In addition to ozone pollution reducing the strength of trees to hold carbon in the northern temperate mid-latitudes by reducing tree growth, the research also indicates that broad-leaf trees, such as poplars, are more sensitive to ozone pollution than conifers, such as pines, and that root growth is suppressed more than aboveground growth.



Portland, Oregon. Researchers have found that modern day concentrations of ground level ozone pollution are decreasing the growth of trees in the northern and temperate mid-latitudes. (Credit: iStockphoto/Tom Wald)

“Beyond the consequences for global warming, the study also infers that in mixed forests conifers will be favored over broad-leaved trees, and that the decrease in root size will increase the vulnerability to storms,” said Wittig.

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Journal Reference:

1. Wittig V.E., Ainsworth E. A., Naidu S.L., Karnosky D. F., Long S.P. **Quantifying the impact of current and future tropospheric ozone on tree biomass, growth, physiology and biochemistry: A quantitative meta-analysis.** *Global Change Biology*, DOI: [10.1111/j.1365-2486.2008.01774.x](https://doi.org/10.1111/j.1365-2486.2008.01774.x)

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