

Lake States Fire Science Consortium

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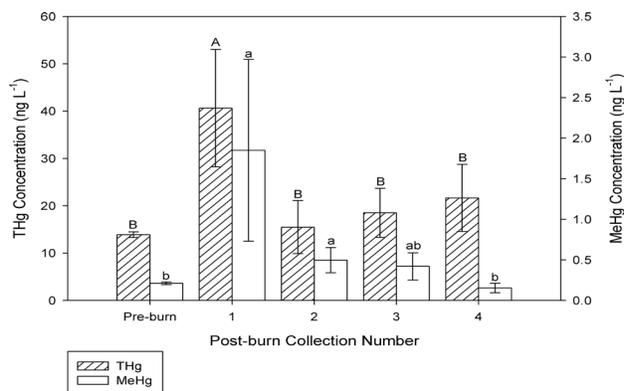


CONNECTING FIRE AND THE MERCURY CYCLE

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Mercury is a pollutant of concern due to its negative impacts on human health. Although the most common route of exposure to humans is through fish consumption, both atmospheric and terrestrial systems are important in the mercury cycle, and influence mercury in fish. Forest fire releases mercury stored in vegetation and soils, with the majority (~95%) going to the atmosphere.

Fire and atmospheric mercury – Mercury concentrations measured in precipitation and throughfall (water that passes through the forest canopy) in areas impacted by smoke from forest fires was elevated by nearly 300% relative pre-burn concentrations. Methyl mercury (the toxic, organic form) concentrations were 8 times higher in throughfall and precipitation in fire impacted areas than non-impacted areas. Conifers are efficient scavengers of atmospheric mercury, and had greater increases in throughfall mercury concentrations than was measured in deciduous throughfall.



Total atmospheric mercury (THg) and methyl mercury (MeHg) concentrations measured during pre-burn and post-burn time periods.



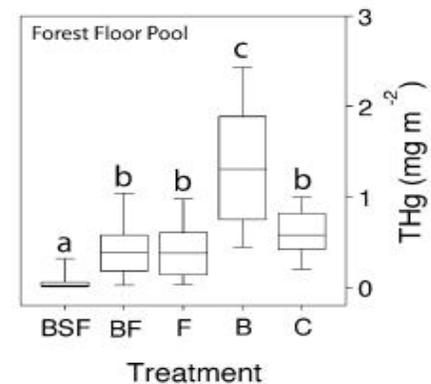
MANAGEMENT IMPLICATIONS

- A portion of the mercury released to the atmosphere may be re-deposited locally resulting in an increased mercury load for catchments near fire impacted areas.
- Fires that consume the forest litter layer and impact the upper mineral soil horizons release previously stored mercury.
- Fire-associated loss of the litter layer and the mercury stored in the litter layer and upper soil horizon may decrease the mercury available for transport to lakes and available for uptake by fish.
- The cumulative impact of multiple disturbances on the mercury cycle is an important consideration when thinking of using fire as a management tool. Combinations of disturbances that may result in increased fire severity increases the potential for mercury losses.

Want to learn more?

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Soil mercury and fire – Soil mercury concentrations measured in northeastern Minnesota showed a 68% loss of mercury from the forest floor due to the combined effects of blowdown, salvage logging, and wildfire. The impact of multiple disturbances on forest floor mercury was greater than any single disturbance (blowdown, salvage logging, or fire). Losses of mercury from the forest floor also increased with increased fire severity.



Total mercury (THg) pools in the forest floor among blowdown-salvage logging-fire treatment (BSF) relative to the other treatments (BF = blowdown-fire; F = fire; B = blowdown; C = control).

Mercury in soils and fish – An examination of mercury in fish and forest soils of northeastern Minnesota indicated that catchments with more mercury in the forest floor were associated with lakes with higher mercury concentrations in age 1 and 2 yellow perch. Additionally, fish from lakes/catchments associated with higher soil organic matter content had higher mercury concentrations.

Potential impacts to fish - The impact of fire on the mercury cycle includes two contrasting mechanisms that might impact fish mercury concentrations. Losses of mercury from the litter layer may decrease the amount of mercury transported to lakes, and subsequently the amount accumulated in fish. Increases in mercury deposition from smoke plumes associated with fire could result in elevated fish mercury concentrations as a result of direct deposition to lakes or increased deposition to catchments and subsequent transport to lakes. A short-term spike in followed by longer term decreases in fish mercury concentrations is one possible outcome of fire as related to fish mercury.

References

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