ABSTRACT

Mercury is present in the atmosphere, forest vegetation, litter, and soils and is easily bioaccumlated, resulting in fish consumption advisories across Minnesota and the United States. Atmospheric mercury deposition by wet and dry processes contributes mercury to terrestrial and aquatic systems. Mercury in forest vegetation and soils may be released by fire and re-deposited to nearby areas. Throughfall and precipitation samples were collected in 2005 and 2006 using passive precipitation collectors across Superior National Forest. Smoke plumes from three fires impacted collectors during the study period. Samples were collected approximately every two weeks and analyzed for total and methyl mercury.

The two objectives of this work were:

i) Quantify atmospheric mercury deposition in northern Minnesota's boreal forest and identify factors controlling the amount of mercury deposited

ii) Determine if fire results in greater atmospheric deposition of mercury to areas near fire.

Forest canopy type and density were the primary influences on total and methyl mercury deposition. Highest total and methyl mercury concentrations were measured beneath conifer canopies (total mercury mean=19.02 ng L^{-1}; methyl mercury mean=0.28 ng L^{-1}) followed by deciduous throughfall (total mercury mean=12.53 ng L^{-1}; methyl mercury mean=0.19 ng L^{-1}) then bulk precipitation (total mercury mean=8.19 ng L^{-1}; methyl mercury mean=0.12 ng L^{-1}). Concentrations of total and methyl mercury increased in conifer throughfall (400% increase) and bulk precipitation (250% increase) samples taken immediately after fire. The amount of total mercury present as methyl mercury

(mean=1.25%) was not impacted by canopy type or by fire. Future changes in forest type and increased fire frequency predicted by climate change models will influence mercury cycling in this system.