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Atmospheric deposition and fate of mercury in high-altitude watersheds of the Rocky Mountains.

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Despite the potential for cold high-altitude ecosystems to act as sinks in the global mercury cycle, atmospheric deposition and fate of mercury have not been measured extensively at mountain sites in the Western United States. At Buffalo Pass in northwestern Colorado (the highest site in the national Mercury Deposition Network at 3234 m elevation), mercury in wet deposition was 9 $\mu g/m^2$ in 2000, comparable to many sites in the upper Midwestern United States where fish consumption advisories are widespread because of elevated levels of mercury from atmospheric deposition. Similar levels of mercury deposition were measured about 90 km east of Buffalo Pass at Loch Vale in Rocky Mountain National Park (RMNP) during 2002.

Concentrations of total mercury in headwater streams in RMNP averaged 2-4 ng/L during spring and summer, 2001-2002. Higher concentrations were observed during snowmelt and rainfall events. Dissolved mercury was generally greater than particulate mercury in these clear mountain streams. Mercury and dissolved organic carbon peaked as soils were flushed during early snowmelt and rainy summer periods. Overall, mercury deposition was greater than mercury export, indicating accumulation in alpine/subalpine ecosystems; however, the mercury exported in streamflow may contribute substantially to mercury loading in downstream lakes and reservoirs where fish consumption advisories have increased.

Methyl mercury concentrations measured in the streams in 2002 were generally near or less than detection limits, however, extreme drought conditions limited hydrologic flushing of soils and wetlands that may be sources of methyl mercury. In 2003, surface and ground water from various alpine and subalpine landscapes were sampled to determine sources and transport of total and methyl mercury. The elevated levels of mercury in atmospheric deposition indicate a need for better understanding of mercury cycling and transport in high-altitude ecosystems of Western North America.