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Total and methyl mercury fluxes in constructed wetlands: Implications for watershed management

In the western United States, there are a significant number of watersheds that have natural and anthropogenically derived mercury (Hg) contamination. Wetland and riparian areas are important aquatic habitats in the water limited west. Given the intense water management due to water right allocations and limited availability, wetlands may be subjected to variable flow regimens. In addition, nutrient inputs associated with irrigated agricuture can impact wetland areas. Wetlands may also be potential sites for formation of methyl Hg (MeHg), a subtle neurotoxin that is bioaccumulated in ecosystems. In fact it is thought that wetlands are important sources of MeHg to downstream ecosystems.

This project investigated the potential for MeHg production in flow-through wetland mesocosms as a function of 1) soil and water Hg concentrations on a seasonal timestep; and 2) experimental manipulations using chemical additions and regulating water flow. Wetland mesocosms (10 total) were densely vegetated and consisted of four replicated experimental designs. Mesocosms had elevated Hg concentrations in sediment (0.1 to 2.0 mg Hg /kg) and water (20 to 350 ng Hg/L) as well as sediment and water with low Hg concentrations similar to ambient. Water quality parameters and Hg concentrations in all mesocosms were monitored for > two years.

In general, the wetlands were a sink for total Hg and seasonally dependent sources for MeHg with greater production in the summer. Mesocosms with contaminated sediments and uncontaminated waters were the most significant MeHg sources. Drying and wetting resulted in flushing of sediment bound MeHg from the wetlands and changes in hydraulic retention time did not influence MeHg production. Chemical manipulations using nitrate additions increasing concentrations by 10 mg/Lproduced no significant change in MeHg concentrations; however sulfate addition significantly increased methyl mercury release.

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