USGS Western Ecological Research Center
Publication Brief

Hybrid Coagulation Treatment Wetland Systems Decrease Mercury in Surface Waters and Fish

Published in *Environmental Science & Technology*, a study authored by USGS, Bachand and Associates, and UC Davis assessed whether two chemical compounds—polyaluminum chloride and ferric sulfate—could be used in combination with a treatment wetland system to remove mercury from agricultural drainage and wetland waters and to decrease mercury bioaccumulation in wetland fishes.

Methylmercury is a toxic compound that can be accumulated in fish and wildlife, posing development risks to those species, as well as to humans if consuming fish at high doses. Shallow, warm bodies of water, such as inland wetlands, provide optimal biogeochemical conditions for mercury methylation. As a result, they often experience high concentrations of methylmercury.

Commercially available coagulants could help mitigate mercury contamination in wetlands. Coagulation with metal-based salts is a technique commonly used during drinking-water and wastewater treatment to remove particles and dissolved organic matter. A prior study coauthored by USGS successfully tested the use of two commercially available coagulants—polyaluminum chloride and ferric sulfate—to reduce mercury concentrations in drainage water, in a laboratory setting.

The latest study sought to demonstrate this effect in the field. The experiments took place on Twitchell Island in the Sacramento-San Joaquin Delta. Researchers found that treating agricultural drainage water with polyaluminum chloride or ferric sulfate successfully decreased total mercury and methylmercury concentrations in wetland waters, and ferric sulfate-treated wetlands also decreased mercury concentrations in wetland fish.

Coagulation with metal based salts is a promising management strategy for removing mercury from the water column. Additional studies are needed to explore potential effects on sediment quality and organisms living in the wetlands.

This Brief Refers To:

Ackerman, JT, TEC Kraus, JA Fleck, DP Krabbenhoft, WR Horwath, SM Bachand, MP Herzog, CA Hartman, PM Bachand. 2015. **Experimental dosing of wetlands with coagulants removes mercury from surface water and decreases mercury bioaccumulation in fish.** *Environmental Science & Technology*. doi:10.1021/acs.est.5b00655
http://www.werc.usgs.gov/ProductDetails.aspx?ID=5264

The coagulation-wetland experiment took place on Twitchell Island in the California's Sacramento-San Joaquin River Delta. Photo: USGS California Water Science Center.

MANAGEMENT IMPLICATIONS

- Mercury contamination is a serious environmental issue in San Francisco Bay and Delta wetlands. Successfully tested technology to reduce available mercury could have significant benefits to water quality, agriculture, fisheries, and wildlife health in this region.
- Polyaluminum chloride and ferric sulfate can remove mercury from surface waters by coagulating the dissolved organic matter and associated mercury, and causing it to settle out of solution. In controlled facilities, the particles can be collected by filtration or particle settling, and then disposed. In the field, coagulated particles can settle out of the water column by passing through constructed wetlands, thereby removing mercury from water and reducing its bioavailability to fish and wildlife.

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